REMARKS/ARGUMENTS

The Office Action mailed March 30, 2004 has been reviewed and carefully considered. Claims 1 and 2 have been amended. Claims 7 is added. Claims 1-7 are pending in this application, with claim 1 being the only independent claim. Reconsideration of the above-identified application, as herein amended and in view of the following remarks, is respectfully requested.

In the Office Action mailed March 30, 2004, claims 1-6 stand rejected and the specification is objected to under 35 U.S.C. §112, first paragraph, as failing to provide an adequate description of the claim limitations in the specification. More specifically, the Examiner states that the present disclosure:

- fails to enable one ordinarily skilled in the art to make and use an attitude measurement/calibration system;
- does not describe any specific techniques for determining an attitude and position with respect to a CCD line and a CCD array;
- does not show detection by comparison to calculated orientation parameters;
- does not show an embodiment using a single source (the drawings show two sources); and
- does not shown an output to make the system complete.

The attitude and position determining system is a conventional system known to those of ordinary skill in the art of photogrammetry. As stated in the specification at page 9, lines 4-6, the attitude and position determining system 10 facilitates determining the exact location of reconnaisance or survey data scanned by the input optics 2 and CCD lines 3. Such attitude and position determining systems are disclosed in the articles filed concurrently herewith in an Information Disclosure Statement, Schwarz, *Integrated Airborne Navigation Systems for*

Photogrammetry, Photogrammetric Week, 1995; Cramer M., et al., *Direct Georeferencing Using GPS/Inertial Exterior Orientations for Photogrammetrical Applications*, IAPRS, Vol. XXXIII, 2000; Cramer, M., et al., *Direct Exterior Orientation of Airborne Sensors*, Journal GIM International, Vol. 13, pp.46-49, September 1999; and Mohamed M.R. Mostafa, *Airborne Direct Georeferenceing of Frame Imagery: An Error Budget*, The 3rd International Symposium on Mobile Mapping Technology, January 3-5, 2001. Examples of these systems are a combination of GPS or DGPS and inertial measurement unit (IMU). Although some of the articles are published after the priority date of the application, they describe the prior art attitude and position determining systems which are known to those of ordinary skill in the art. Accordingly, one of ordinary skill in the art would be enabled by the specification to make and use the claimed attitude and position determining system.

Regarding the determination of attitude and position using the CCD matrices, the present specification discloses that a source 5 is arranged relative to input optics 2 which are integrated into the optoelectronic sensor system 1 (see page 9, lines 12-14 of the specification). Beams from the optical sources 5 are widened by the input optics and are reflected off of the reference module of a known position and projected back to the input optics. The reflected beams are registered on the CCD matrices of the optoelectronic sensor system 1. Since the light source 5 is at a fixed location relative to the input optics 2 and the CCD matrices 6, the image of the reflected light source from the reference module of known position can be used to determine the attitude and position of the optoelectronic sensor system using the principles of geometry and optics. This would be known to those of ordinary skill in the art. Accordingly, the specification enables one or ordinary skill in the art to determine an attitude and position using the CCD matrices.

The Examiner alleges that no comparison of the calculated orientation parameters with the parameters determined within the attitude and positioning system 10 is shown. This comparison is performed within the attitude and positioning system 10.

Regarding the single light source, the claims have been amended to reflect that at least two light sources are used.

The Examiner further states that no output is shown. However, the result of the device is implemented within the attitude and positioning system 10.

In view of the above amendments and remarks, the rejection of claims 1-6 under 35 U.S.C. §112, first paragraph, should be withdrawn.

Claims 1-6 stand rejected under 35 U.S.C. §103 as unpatentable over U.S. Patent No. 5,793,483 (Zehnpfennig).

Before discussing the cited prior art and the Examiner's rejections of the claims in view of that art, a brief summary of the present invention is appropriate. The present invention relates to a calibration system for calibrating the orientation parameters of digital optoelectronic sensors arranged in a carrier such as an aircraft or a satellite. The present invention includes an attitude and positioning system 10 which is used for determining orientation parameters during flight (see page 6, lines 7-10; page 9, lines 2-4; and Fig. 1). The calibration system also includes an optoelectronic component, i.e., a light source, that emits light in a defined direction with respect to the attitude and position determining device (page 6, lines 10-12). A planar optical detector including CCD matrices 6 detects the reflection of the radiation emitted by the light source and reflected off of a reference module 7 (page 6, lines 12-15; and page 9, lines 14-17). The reference module 7 is arranged on the ground at a known position. The relative attitude and position of the focal plane 4 with respect to the known orientation of the reference module 7 is determined from the

signal from the CCD matrices 6 in the attitude and position determining system 10. The attitude and position determining system 10 then determines the offset of parameters determined by the attitude and position determining system 10 (page 7, lines 3-6; and page 9, line 20 to page 10, line 2). That is, the attitude and position determining system determines orientation parameters during flight. During calibration, orientation parameters are calculated based on radiation signals emitted by a light source, reflected off of a reference module having a known position and orientation, and received by CCD matrices on a focal plane. These calculated parameters are used as a reference signal to determine the offset of the parameters determined by the attitude and position determining system 10.

Independent claim 1 is amended to clarify the invention and recites "wherein said attitude and positioning determining system is connected to said planar optical detector and operatively arranged for calculating calculated orientation parameters using the reflection of the radiation received by said planar optical detector and the known fixed location of said reference module, said attitude and position determining system is further operatively arranged for detecting offsets in the determined orientation parameters by comparing the determined orientation parameters to the calculated orientation parameters".

Zehnpfennig discloses an optical measurement system for determining the orientation of an object 12, 12a (see col. 4, lines 5-7; and col. 5, lines 49-51 of Zehnpfennig). In Fig. 1 of Zehnpfennig, sources 16, 18, 20 are arranged on the object 12 and detectors 22, 24, 26 are arranged on a metrology frame 14 (col. 4, lines 10-13 and 23-25). The detectors 22, 24, 26 detect signals from the sources 16, 18, 20 and phases of the signals are used to determine the instantaneous position and orientation of the object (col. 4, lines 35-39). In Fig. 1A, both the source and the

detectors are arranged on the metrology frame 14 and reflectors are arranged on the object 12a, whose orientation is to be determined (col. 5, lines 30-35).

Zehnpfennig fails to disclose "wherein said attitude and positioning determining system is connected to said planar optical detector and operatively arranged for calculating calculated orientation parameters using the reflection of the radiation received by said planar optical detector and the known fixed location of said reference module, said attitude and position determining system is further operatively arranged for detecting offsets in the determined orientation parameters by comparing the determined orientation parameters to the calculated orientation parameters", as recited in independent claim 1. Zehnpfennig discloses a system for determining an orientation of an object for helmet tracking, in flight simulators, heads-up displays, instructional and training systems, and virtual reality systems (col. 1, lines 21-25). Zehnpfenning further discloses that other applications may include measurement of features on large structures, vibration monitoring, and indoor navigation and precision measurement of positions and orientations of probe assemblies in coordinate measurement machines (col. 1, lines 25-34). Accordingly, Zehnpfennig merely discloses a device for determining an orientation and fails to teach suggest or motivate one of ordinary skill in the art to compare the calculated orientation parameters based on the known location of the reference module to determined orientation parameters determined by the attitude and position determining system in a mobile carrier, as recited in independent claim 1.

The Examiner states that the claimed comparison is obvious because relative orientation is the parameter being measured in Zehnpfennig and that a known orientation must be established for subsequent measurements to have any meaning. Even if a known orientation is to be established to a known reference position, there is still no suggestion for comparing the calculated

orientation parameters based on the known location of the reference module to the determined orientation parameters determined by the attitude and position determining system of a mobile carrier, as recited in independent claim 1.

In view of the above amendments and remarks, it is respectfully submitted that independent claim 1 is allowable over Zehnpfennig.

Dependent claims 2-7, being dependent on independent claim 1, are deemed allowable for the same reasons expressed above with respect to independent claim 1.

Furthermore, Zehnpfennig fails to disclose the limitation of dependent claim 4 which recites "a CCD line scanner comprising CCD lines arranged on a focal plane of device optics for obtaining remote reconnaissance data, wherein said planar optical detector is arranged between said CCD lines". There is no teaching or suggestion for arranging the detectors of Zehnpfennig with a CCD line scanner for obtaining remote reconnaissance data. Accordingly, independent claim 4 is allowable for at least these additional reasons.

Zehnpfennig also fails to disclose the limitations of dependent claim 3 and new dependent claim 7 which recite " wherein said planar optical detector comprises a CCD matrix". There is no teaching or suggestion that the detectors are a CCD matrix. Rather, Zehnpfennig discloses that the detectors measure phases. Accordingly, dependent claims 3 and 7 are allowable for these additional reasons.

The application is now deemed to be in condition for allowance and notice to that effect is solicited.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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